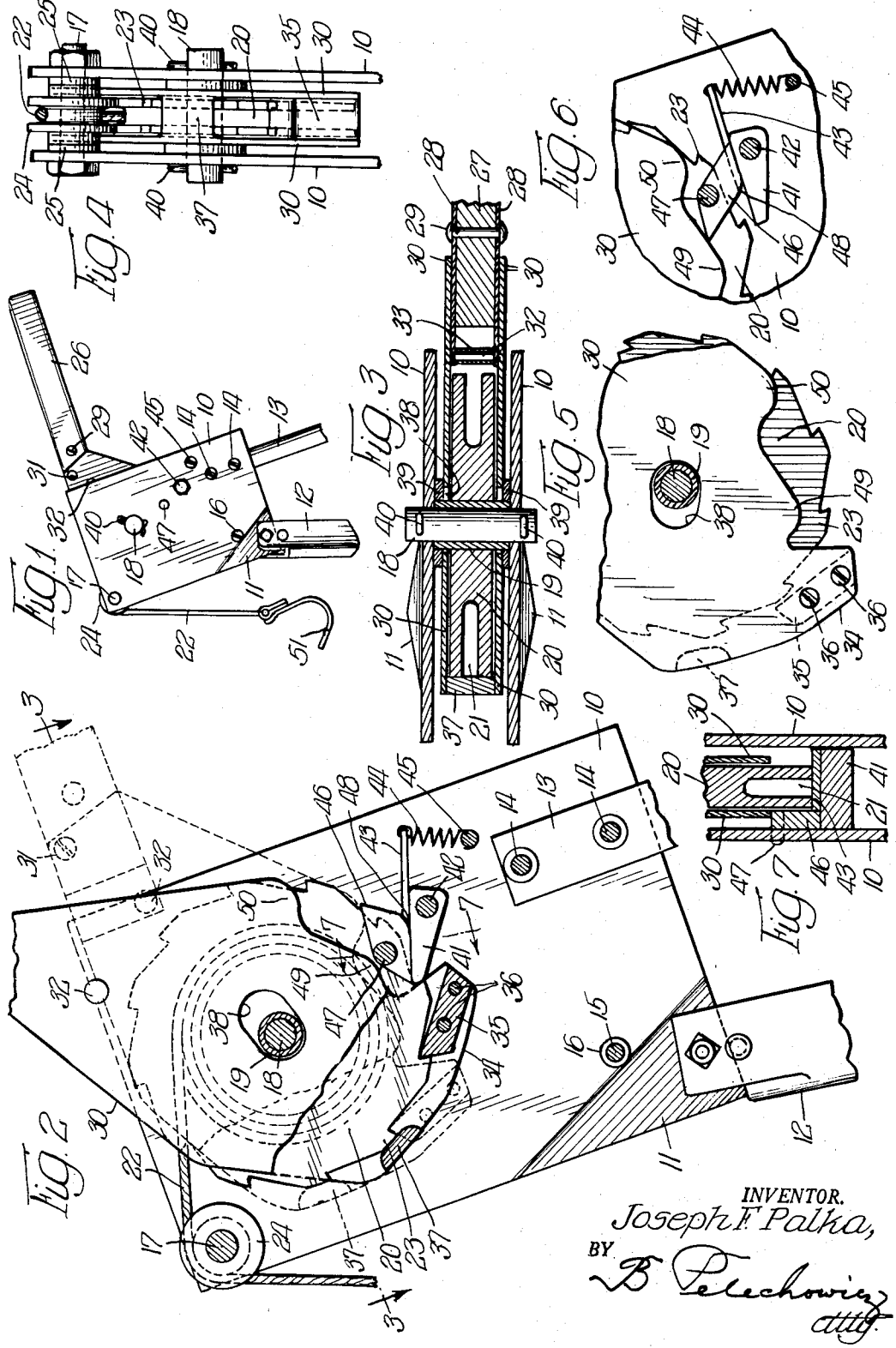
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CABLE AND RATCHET WHEEL LIFTING JACK

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CABLE AND RATCHET WHEEL LIFTING JACK

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The present invention relates to lifting jacks embodying a ratchet wheel with a load engaging cable affixed and wound therearound, with means for imparting a rotary movement to said ratchet wheel in one or the opposite direction for the purpose of lifting or lowering the load, the objects of the invention being substantially the same as are enumerated in my co-pending application, Serial No. 301,900, filed July 31, 1952.

Another object of the present invention is the provision in a jack of the character indicated of a handle provided with a rigid detent bar, which in cooperation with a coacting pawl, is capable of engaging the teeth of a ratchet wheel for imparting a rotary movement to the ratchet wheel when the handle is reciprocated, the handle being adjustably pivoted upon the shaft carrying the ratchet wheel so that said detent bar may intermittently engage the teeth of the ratchet wheel when the handle is reciprocated.

A still further object of the present invention is the provision of an oblong slot in the handle aforesaid through which a pivot is passed for permitting shifting of the handle with relation to the ratchet wheel so that the detent bar aforesaid may alternately engage the radial side of a tooth in the ratchet wheel and then ride upon the inclined side of the tooth preceding the engagement of the radial side of said latter tooth for imparting a rotary movement to the ratchet wheel.

With the above general objects in view and others that will appear as the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawing and pointed out in the appended claims.

In the drawing forming a part of this application and in which like designating characters refer to corresponding parts throughout the several views:

Fig. 1 is a side elevational view of the head portion of the present invention within which the mechanism for winding or unwinding a load-supporting cable is supported, with the supporting part of the invention broken away;

Fig. 2 is an enlarged side elevational view of the mechanism for winding or unwinding a cable upon a ratchet wheel, with one side plate of the head portion of the invention removed;

Fig. 3 is a cross sectional view on line 3—3 of Fig. 2;

Fig. 4 is a front edge elevational view of the head portion of the invention, including the mechanism for winding or unwinding a load-supporting cable;

Fig. 5 is a fragmentary side elevational view of the ratchet wheel and the handle, illustrating the relative position of the two parts at the time when the detent bar carried by the handle is out of engagement with the teeth of the rachet wheel;

Fig. 6 is a side elevational view of a pawl actuable by a cam into an inoperative position, the cam being actuated by the handle, the view showing the position of the pawl during an interval when a rotary movement is imparted to the ratchet wheel for causing the unwinding of the cable for lowering the load; and

Fig. 7 is a cross sectional view on line 7—7 of Fig. 2.

Referring in detail to the present drawing there is shown a pair of head plates **10** within which the mechanism for winding a load supporting cable in either direction is located. The front lower corner of each of said plates **10** is bent outwardly for defining leaf **11**, to which standard **12** is pivotally attached. Leg **13** by its upper end is positioned within the two plates **10** and rigidly affixed thereto by means of bolts **14**. Standard **12** and leg **13** constitute part of the support, more clearly shown in my said co-pending application, for supporting the head part of the jack, including said plates **10** and the lifting mechanism located between said plates.

In addition to said bolts **14** head plates **10** are maintained in a relative rigid spaced position by bolt **15** upon which an encompassing collar **16** is set, and which bears against the inner faces of said plates **10**. The pulley supporting shaft **17** and the ratchet wheel supporting shaft **18** further maintain said plates **10** in their relative rigid spaced position. Lining said shaft **18** is collar **19**, the ends of which contact and bear against the inner faces of said plates **10**.

Set for rotary movement upon said collar **19** is ratchet wheel **20** which is provided with circumferential groove **21** for receiving therewithin cable **22**, the inner end of which is in any suitable manner rigidly affixed to the body portion of said ratchet wheel **20** and at the bottom of said groove **21**. Said cable is adapted to wind within said groove **21**, a number of convolutions of the said cable being shown in dotted lines in Fig. 2. Said groove **21** slits the rim portion of ratchet wheel **20** into a pair of spaced rim sections, each of which is provided with teeth **23**. The pairs of said teeth **23** in the two rim sections of the ratchet wheel are mutually alined on transverse planes.

By virtue of that arrangement the detent bar and the pawl hereinafter described engage simultaneously the alined teeth in the two rim sections of ratchet wheel **20**. For all practical purposes however the several pairs of alined teeth in the two rim sections of the ratchet wheel may be considered as single teeth and they shall be referred as such in the following description.

Shaft **17** positioned at the upper corner of plates **10** and above standards **12** supports pulley **24** over which said cable **22** is passed. Spacers **25** set upon said shaft **17**, one on each side of pulley **24**, maintain the said pulley in a centered position within the space defined by said plates **10** and in an alinement with groove **21** of ratchet wheel **20**.

The handle for actuating said ratchet wheel **20** includes handle bar **26**, which may be made of wooden piece **27** lined on the sides with metal covers **28**, said wooden piece **27** and metal covers **28** being joined and maintained in a rigid relative position by a plurality of rivets **29** passed in a transverse relation through said handle bar **26**. The operative part of the handle includes a pair of spaced plates **30**, which remain in a superimposing relation with handle bar **26** and which are connected to the latter by means of bolt **31** and rivet **32**. Rivet **32** carries collar **33**, the ends of which bear against the inner faces of covers **28** for maintaining the latter and said plates **30** in a mutual rigid spaced position.

The opposite, front ends of said plates **30** are formed into downwardly directed projections **34**. Interposed between said projections **34**, adjacent their free lower ends, is detent bar **35**, which is rigidly affixed to said projections by means of a plurality of screws **36** or other suitable means. Said detent bar **35** is in a transverse relation with ratchet wheel **20** and its two rim sec-

tions defined by said groove 21. The upper end of said detent bar 35 is beveled to engage the alined teeth in the ratchet wheel.

Spaced from said detent bar 35 is an upward direction said plates 30 have bar 37 interposed therebetween and rigidly affixed thereto, adjacent the front marginal edges of said plates 30. Said bar 37 by its inner face is adapted to bear against and ride upon the inclined sides of said teeth 23, and in order to facilitate that function of said bar 37 the inner face thereof is beveled so as to eliminate sharp corners. In addition to the principal functions of said detent bar 35 and bar 37, later described in detail, the same also rigidly interconnect two plates 30.

The head portions of plates 30 are each provided with an oblong slot 38, the two of which are substantially in a parallel relation with the longitudinal axis of the handle.

Passed through slots 38 in both plates 30 are supporting shaft 18 and collar 19. By virtue of this arrangement the handle is capable of a longitudinal shifting movement, that is a movement which is diametrical with relation to ratchet wheel 20, for the purpose which will be later apparent.

Obviously, each of said plates 30 is interposed between one face of said ratchet wheel 20 and the adjacent plate 10. For the purpose of maintaining said plates 30 in a proper position relative to ratchet wheel 20 and in a spaced relation with each plate 10, and further for preventing shifting of said plates 30 longitudinally of shaft 18, washers 39 are interposed between said handle plates 30 and adjacent plates 10.

Shaft 18 extends beyond the outer faces of plates 10, the projecting ends receiving dowel pins 40 for preventing longitudinal movement of said shaft 18 and also for maintaining said ratchet wheel 20 and plates 30 within said plates 10.

Pawl 41 is pivoted upon pin 42 for angular swinging movement into or out of engagement with teeth 23 of ratchet wheel 20. Arm 43, in any suitable manner affixed to the upper face of said pawl 41, extends rearwardly. Coil spring 44 by one of its ends is engaged at pin 45, while the opposite end of said coil spring engages the free end of said arm 43, by virtue of which construction and the tension of said coil spring 44 exerted upon said arm 43 said pawl 41 is normally urged in engagement with teeth 23 of ratchet wheel 20.

Co-acting with said pawl 41 is rhomboid-shaped cam 46. Said cam 46 is disposed between one of said plates 10 and the adjacent face of ratchet wheel 20, and is pivoted, adjacent one of its corners, upon pin 47. Said pin 47 is affixed to only one plate 10, and by its opposite end remains flush with the face of said cam 46 disposed nearest to ratchet wheel 20, as is indicated in Fig 7. Said pin 47 is located adjacent the upper, obtuse angle of said cam 46. The opposite corner of said cam 46, adjacent the opposite obtuse angle thereof, is rounded, as at 48, for facilitating shifting of the said cam to inoperative or operative positions, seen in Figs. 2 and 6, respectively.

The depressing of pawl 41 by cam 46 for bringing said pawl to an inoperative position, that is out of engagement with teeth 23 of ratchet wheel 20, is of course against the tension of spring 44. When cam 46 is brought to an inoperative position, shown in Fig. 2, pawl 41 automatically springs towards the rim of ratchet wheel 20 to come into an engagement with teeth 23, which action is due to the tensioning of spring 44 exerted upon arm 43.

Actuation of cam 46 to operative or inoperative positions, illustrated in Figs 6 and 2, respectively, is effected by bulges 49 and 50 extending from the lower edge of the head portion of handle plate 30 which overhangs said cam 46. Normally pawl 41 is in engagement with teeth 23 of ratchet wheel 20, due to the action of spring

44, as was hereinabove stated, assuming of course that cam 46 remains in an inoperative position, illustrated in Fig. 2. When bulge 50 comes in engagement with said cam 42, as indicated by dotted lines in Fig. 2, a downward pressure by said bulge 50 upon said cam adjacent one of the acute angles thereof, will force angular shifting movement of said cam 46, upon its pivot 47, and thereby will depress pawl 41, against the tension of spring 44, for bringing said pawl 41 to an inoperative position, that is out of engagement with teeth 23 of ratchet wheel 20, position illustrated in Fig. 6. When however the handle is swung to an upward direction by its handle bar 26, bulge 49 will come in engagement with the portion of cam 46 adjacent the opposite acute angle thereof, as seen in Fig. 6, and further pressure upon said cam by said bulge 49 will angularly shift said cam back to its inoperative position shown in Fig. 2, and thereby will bring said pawl 41 back to its operative position shown in Fig. 2, in engagement with teeth 23 of ratchet wheel 20.

The free end of cable 22 is provided with hook 51 to be engaged with any part of an object to be lifted, such as a bumper bar in an automobile.

In order to lift any object by means of hook 51 and cable 22, the latter is to be caused to wind upon and around the hub portion of ratchet wheel 20, that is within said wheel and in groove 21 thereof. To do this it is necessary to impart a rotary shifting movement to said ratchet wheel 20 in a clockwise direction as viewed in Fig. 2.

To wind said ratchet wheel 20 to a clockwise direction as viewed in Fig. 2, care of course must be taken that pawl 41 should be at all times in contact with the rim of the said wheel in order to prevent the unwinding of the said ratchet wheel to a counter-clockwise direction when said wheel is under a pulling force due to the weight carried by cable 22. In order to maintain said pawl 41 in engagement with the rim of the ratchet wheel and thereby in engagement successively with teeth 23 of said ratchet wheel 20 as the latter is caused to shift to a clockwise direction as viewed in Fig. 2, care of course must be taken that during the shifting movement of the ratchet wheel to the clockwise direction cam 46 remains in its inoperative position shown in Fig. 2. This result is very readily brought about when care is taken that handle bar 26 is not manually shifted to its fullest extent to either direction, that is up or down, so as to prevent bulges 49 or 50 to ever come in contact with said cam 46. If cam 46 remains undisturbed, particularly by bulge 50 upon the downward shifting movement of handle bar 26 said cam cannot be brought to the operative position, shown in Fig. 6, thereby assuring constant engagement of pawl 41 with the rim of ratchet wheel 20.

In the full lines in Fig. 2 is shown the position of handle bar 26 after it has been upwardly shifted from its downward position. That position of Fig. 2 of said handle bar is immediately preceding its shifting in a downward direction for advancing ratchet wheel 20 in its shifting movement to the clockwise direction as viewed in Fig. 2 to the extent of the distance defined by a pair of adjacent teeth 23. During the downward shifting movement of the handle from its position shown in Fig. 2 shaft 18 and sleeve 19 remain within the end of slot 38 shown in Fig. 2, with detent bar 35 in engagement with tooth 23, and bar 37 in contact with the inclined side of the adjacent tooth in the upward, that is in the clockwise direction from the tooth with which said detent bar 35 is in engagement.

It should be noted at this point that when the handle has been fully shifted to the upward direction shown in Fig. 2 slot 38 does not remain in a vertical position, but is in a diagonal position. Were the handle bar 26 released from its manual hold the whole handle would bodily shift downwardly due to gravity, with the result

that detent bar 35 and bar 37 would come out of engagement with their respective teeth, with shaft 18 and sleeve 19 falling, or rather finding themselves, within the opposite end of said slot 38 from that shown in Fig. 2. Should the handle bar 26 be manually grasped again and pulled toward the right direction, as viewed in Fig. 2, the engagement of detent bar 35 and bar 37 with their respective teeth would be reestablished, with said shaft 18 and sleeve 19 again finding themselves within the lower end of slot 38, as seen in Fig. 2.

The downward shifting movement of handle bar 26 causes wheel 20 to rotatably shift in clockwise direction, as viewed in Fig. 2, until the next tooth 23 has shifted past pawl 41, and the latter engages its radial side, as seen in Fig. 2. During this latter downward shifting movement of handle bar 26 care must be taken not to permit bulge 50 to come in contact with cam 46.

Once ratchet wheel 20 has shifted so that the next succeeding tooth 23 has come in engagement with pawl 41 the handle is manually pushed in an axial direction in order to disengage detent bar 35 and bar 37 from the teeth of the ratchet wheel, with shaft 18 and sleeve 19 in the opposite end of slot 38, from that shown in Fig. 2. This latter action of the handle with relation to ratchet wheel 20 is best shown in Fig. 5. Said detent bar 35 and bar 37 having been disengaged from their respective teeth 23, handle 26 may then be shifted in an upward direction until it comes to the position shown in full lines in Fig. 2. Simple shifting of said handle back in the direction of the operator will re-engage said detent bar 35 and bar 37 with a pair of adjacent teeth, as was hereinabove described.

The downward shifting of handle bar 26 will cause the rotary shifting movement of said ratchet wheel 20, until the next adjacent tooth 23 has come in engagement with pawl 41.

Repetition of the shifting movement of handle bar 26 in upward and downward directions will advance ratchet wheel 20 in its rotary movement as far as desired in order to wind therearound a required length of cable 22 for lifting to a required distance from the ground of the object engaged by hook 51.

To cause the unwinding of cable 22 in order to lower the load engaged by hook 51, a rotary shifting to a counter-clockwise direction, as viewed in Fig. 2, must be imparted to ratchet wheel 20. In order to bring about this result, the following procedures are resorted to:

1. Handle bar 26 is shifted downwardly as far as the same will go, with detent bar 35 and bar 37 in engagement with their respective teeth, with shaft 18 and sleeve 19 within the end of slot 38 shown in Fig. 2. Shifting of said handle bar 26 in a downward direction, as far as said handle bar will go, will bring about pressure by bulge 50 upon the adjacent end of cam 46, for the purpose of bringing said cam 46 to an operative position shown in Fig. 6, to thereby release the engagement of pawl 41 with tooth 23 of ratchet wheel 20.

2. Once pawl 41 is out of engagement with teeth 23 of ratchet wheel 20 the pressure of the lifted object upon hook 51 will cause cable 22 to unwind, or rather to pull upon ratchet wheel 20, to cause the latter to rotatably shift to a counterclockwise direction, as viewed in Fig. 2. The handle being in engagement with ratchet wheel 20, by virtue of tooth 23 being in engagement with detent bar 35, the entire handle is angularly shifted upon its pivot 18—19, with the lower end of the handle assembly shifting towards pawl 41, and with handle bar 26 shifting to the opposite direction, that is to an upward direction, and as far as said handle will go. This shifting movement of the handle bar 26 in the upward direction, due to the actuation thereof by ratchet wheel 20 brings bulge 49 to bear against the opposite corner of cam 46, as seen in Fig. 6, which operation brings said cam 46 to its inoperative position, seen in Fig. 2, and

with it pawl 41 in engagement with the succeeding, presently shifted, tooth 23 of ratchet wheel 20.

3. Handle bar 26 with its plates 30, and detent bar 35 and bar 37, are all permitted, due to gravity, to shift downwardly, until shaft 18 and sleeve 19 find themselves within the opposite end of slot 38, with detent bar 35 and bar 37 out of engagement with the teeth of the ratchet wheel. This relative position of the handle with respect to the ratchet wheel clears said detent bar 35 and bar 37 from their engagement with said ratchet wheel, as is clearly seen in Fig. 5. This operation disengages detent bar 35 with tooth 23 of ratchet wheel 20.

4. Shifting of the handle bar 26 in a downward direction will re-establish the engagement of the handle with the teeth of ratchet wheel 20, except, that the engagement of the detent bar 35 will take place with the adjacent tooth 23, in a clockwise direction, as viewed in Fig. 5, with bar 37 in contact with the tooth immediately thereabove, the position shown in dotted lines in Fig. 2. Obviously, this last operation will cause pivot 18—19 to find itself within the end of slot 38 opposite from that shown in Fig. 5, and shown in Fig. 2. Just a trifle of further downward manual pulling upon handle bar 26 will bring bulge 50 in contact with the adjacent end of cam 46 for the purpose of actuating the latter to an operative position, shown in Fig. 6.

Repetitions of the above enumerated operations will bring about rotary shifting movement of ratchet wheel 20 to a counterclockwise direction as viewed in Fig. 2 for the purpose of causing the unwinding of cable 22 from said ratchet wheel with the object of lowering the load engaged by hook 51 and supported by said cable 22. Obviously, once the load has been lowered to the ground no further rotary shifting movement of ratchet wheel 20 in a counter-clockwise direction as viewed in Fig. 2, or the unwinding of cable 22 therefrom, is possible or for that matter necessary, in view of the fact that the pulling pressure by the load upon the cable, and by the cable upon wheel 20 is a prerequisite condition whereby detent bar 35 and pawl 41 may act as an escapement mechanism for advancing the rotary shifting movement of ratchet wheel 20 to the counter-clockwise direction as viewed in Fig. 2 and to the distance defined by a pair of adjacent teeth 23, lengthwise of the periphery of wheel 20 during each completion of the above enumerated operations.

It is noted that bar 37 has a very important function. The distance between said bar 37 and the adjacent end of said slot 38 is slightly less than the radius of ratchet wheel 20. The result of that arrangement is that when said bar 37 is in contact with the inclined side of any given tooth 23 of the ratchet wheel the body portion of plates 30 adjacent the end of said slot 38 which is nearest to said bar 37 remains in a spaced relation with collar 19, as is clearly seen in Fig. 2, thereby reducing friction between said plates 30 and their pivot 18—19. Of course, when the handle is pulled downwardly, said plates 30 come in contact by a point along the upper marginal body portion of said plates 30 adjacent slot 38 with said pivot for the purpose of bringing about a fulcrum upon which the handle bears in its downward angular shifting movement.

While there are described herein preferred embodiments of the present invention, it is nevertheless to be understood that minor changes may be made therein without departing from the spirit and scope of the invention as claimed.

What I claim as new is:

1. A lifting jack comprising a supporting member, a pivot mounted in said supporting member, a ratchet wheel journaled upon said pivot for rotary movement and having teeth thereon, said ratchet wheel receiving a load-engaging cable in a wound relation therewith, a handle, said handle being provided with an oblong slot within which said pivot is accommodated, a pawl normally in

engagement with the teeth of said ratchet wheel for preventing the latter from rotating in the direction of the pull exterted upon said ratchet wheel by the load weighted cable, and a teeth engaging member carried by said handle, when an angular movement is imparted to said handle in one direction said teeth engaging member being adapted to engage the teeth upon said ratchet wheel for imparting a rotary movement thereto in the direction opposite from the direction of the pull exerted upon said ratchet wheel by the load weighted cable for causing winding of said cable upon said ratchet wheel for elevating the load engaged by the cable, during said angular movement of said handle in said one direction, said slot being disposed with one of its ends adjacent said pivot, when a shifting movement is imparted to said handle substantially in a longitudinal direction with relation to said slot for positioning the opposite end of said slot adjacent said pivot, said teeth engaging member being adapted to come out of engagement with the teeth of said ratchet wheel permitting an angular shifting movement of said handle in an opposite direction without affecting said ratchet wheel.

2. A lifting jack comprising a supporting member, a pivot mounted in said supporting member, a ratchet wheel journaled upon said pivot for rotary movement and having teeth thereon, said ratchet wheel receiving a load-engaging cable in a wound relation therewith, a handle, a detent bar carried by said handle, said handle being provided with an oblong slot within which said pivot is accommodated, when said slot is so located that said pivot is adjacent the end of said slot which is nearest to said detent bar the latter being in engagement with the teeth upon said ratchet wheel, a pawl normally in engagement with the teeth of said ratchet wheel for preventing the latter from rotating in the direction of the pull exerted upon said ratchet wheel by the load weighted cable, a cam in association with said pawl, and means coacting with said handle for alternately bringing said cam into operative or inoperative position for disengaging or engaging said pawl with the teeth of said ratchet wheel, said means being operable on maximum angular shifting movement of said handle in opposite directions, said handle being capable of shifting in a diametrical direction with relation to said ratchet wheel for positioning the opposite end of said slot adjacent said pivot for disengaging said detent bar from the teeth upon said ratchet wheel, shifting of said cam into operative position is timed with the engagement of said detent bar with the teeth of said ratchet wheel for permitting the unwinding of the cable from said ratchet wheel for lowering the load engaged by said cable.

3. A lifting jack comprising a supporting member, a pivot mounted in said supporting member, a ratchet wheel journaled upon said pivot for rotary movement and having teeth thereon, said ratchet wheel receiving a load-engaging cable in a wound relation therewith, a handle, said handle being provided with an oblong slot within which said pivot is accommodated, a pawl normally in engagement with the teeth of said ratchet wheel for preventing the latter from rotating in the direction of the pull exerted upon said ratchet wheel by the load weighted cable, a teeth-engaging member rigidly attached to said handle in such a position that, when one end of said slot is adjacent said pivot and angular movement in one direction is imparted to said handle, said teeth-engaging member will engage the teeth of said ratchet wheel and impart a rotary movement thereto in a direction to wind the cable thereon and thereby to lift the load engaged by the cable, and, when the other end of the said slot is adjacent said pivot, said teeth-engaging member will be spaced from the teeth on said ratchet wheel to permit angular movement of said handle in the opposite direction without affecting said ratchet wheel, and a lug rigidly attached to said handle in position to engage the outer surface of a portion of a tooth on said ratchet wheel when said one end of said slot is adjacent said pivot, the distance between said lug and said one end of said slot being less than the distance between said pivot and the tooth portion engaged by said lug, whereby said one end of said slot is prevented from frictionally engaging said pivot during angular movement of said handle.

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